REMARKS

Reconsideration of the application in view of the above amendments and the following remarks is respectfully requested.

I. The Invention

The present invention provides an improved method and associated apparatus for identifying articles of interest by employing a plurality of RF antennas positioned on articles of interest, wherein each RF antenna has a non-linear element associated therewith and wherein each RF antenna is resonant at one of a plurality of different RF frequencies. RF energy of a first frequency is employed to interrogate one of the RF antennas. As a result of the non-linear element, the RF energy of a first frequency is converted into reflected RF energy of a second frequency that is different from the first frequency. The reflected RF energy is sensed and, on the basis of *the difference between the first frequency of the interrogating energy and the different frequency of the reflected RF energy (i.e., by subtracting one from the other)*, a determination is made as to which specific antenna is present on the article. These features are recited in independent method claim 1 and independent apparatus claim 15.

The present invention also provides a method and apparatus for monitoring an ambient physical condition such as temperature, pressure, humidity, chemical environment, light, pH, biological toxins, radiation, or mid stress-strain, among others. In particular, an RF antenna has associated therewith a non-linear element *whose response (i.e., the frequency it will cause to be reflected) depends on the physical property being monitored.* RF energy of a first frequency is employed to interrogate the RF antenna. As a result of the non-linear element, the RF energy of a first frequency is converted into a reflected RF energy of a different frequency from the first frequency. Because the response of the non-linear element is dependent on the value of the property being monitored, the value of the different frequency that is reflected will depend on and vary based upon *the physical property being monitored.* By comparing the reflected frequency to the transmitted first frequency, *and in particular by determining a difference between the two frequencies (i.e., by subtracting one from the other),* the level of or changes in the ambient physical property can be monitored. These features are recited in independent method claim 24 and independent apparatus claim 33.

II. Status of the Claims

Claims 1-41 are pending in this application. In the Office Action mailed on March 21, 2007, claims 1-41 were objected to based on a minor informality, claims 15-18 and 20-21 were rejected under 35 U.S.C. §102, and claims 1-14, 19, and 22-41 were rejected under 35 U.S.C. §103. Claims 1, 15, 18, 19, 24 and 33 have been amended.

III. Objection to the Claims

The Examiner objected to claims 1-41 based on a punctuation informality. The Applicants have amended claims 1, 15, 24 and 33 as suggested by the Examiner, and therefore request that the rejection be withdrawn.

IV. Rejections Under 35 U.S.C. § 102 and § 103

The Examiner rejected claims 15-18 and 20-21 under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 5,883,575 to Ruby et al. In addition, the Examiner rejected claims 1-14, 19, and 22-41 under 35 U.S.C. § 103 as being unpatentable over Ruby et al. in view of United States Patent No. 3,911,434 to Cook.

Claim 1 as amended recites a method of identifying an article of interest including steps of "interrogating said one RF antenna with RF energy of a first frequency," "converting said interrogating RF energy into reflected RF energy of a different frequency from said first frequency," "sensing said reflected RF energy," "determining a difference between said first frequency and said different frequency by subtracting one of said first frequency and said different frequency from the other of said first frequency and said different frequency," and "on the basis of said difference ... determining if a specific said antenna is present." Similarly, claim 15 as amended recites an apparatus for determining if an article of interest is present that includes "an RF frequency generator for directing RF energy of a particular frequency to said one of said at least one antenna, said non-linear element causing said one of said at least one antenna to transmit reflected RF energy in response to receipt of said RF energy, said reflected RF energy having a reflected frequency that is different than said directed particular frequency," "a detector for receiving said reflected RF energy from said one of said at least one antenna," and "a processor adapted to determine a difference between said directed particular frequency and said reflected frequency by subtracting one of said directed particular frequency and said reflected frequency from the other of said directed particular frequency and said reflected frequency and to determine from said difference between said reflected frequency and said directed particular frequency whether the one of said at least one antenna is a specific antenna." Thus, claim 1 and 15 have in common the feature that reflected RF energy is sensed and, on the basis of *a determined mathematical difference between a first frequency of the interrogating energy and a different frequency of the reflected RF energy (i.e., by subtracting one from the other)*, a determination is made as to which specific antenna is present on an article.

Claim 24 recites "interrogating said RF antenna with RF energy of a first frequency," "converting the interrogating RF energy into reflected RF energy of a different frequency from said first frequency, said different frequency being dependent on the physical property being monitored," "sensing said reflected RF energy," "determining a

difference between said first frequency and said different frequency by subtracting one of said first frequency and said different frequency from the other of said first frequency and said different frequency," and "on the basis of said difference between said first frequency and said different frequency determining the state of said physical property." Similarly, claim 33 recites "an RF frequency generator for directing RF energy at a particular frequency to said antenna, said non-linear element causing said antenna to transmit reflected RF energy in response to receipt of said RF energy, said reflected RF energy having a reflected frequency that is different than said directed particular frequency and that is dependent on the physical property being monitored," "a detector for receiving said reflected RF energy from said antenna," and "a processor adapted to determine a difference between said particular frequency and said reflected frequency by subtracting one of said particular frequency and said reflected frequency from the other of said particular frequency and said reflected frequency and to determine from said difference between said particular frequency and said reflected frequency the state of the physical property being monitored." Thus, claim 24 and 33 have in common the feature that a non-linear element causes energy to be reflected in response to the receipt of interrogating energy wherein the frequency of the reflected energy is dependent on the value of the property being monitored and is different than the frequency of the interrogating energy, and the feature that the state of a physical property being monitored is determined *by determining a mathematical difference between the two frequencies (i.e., by subtracting one from the other)*.

Ruby et al. describes an RF tag that receives a broadband interrogation signal from an interrogator. As shown in Figure 2, the broadband interrogation signal extends from a low frequency I_L to a high frequency I_H. The RF tag utilizes a thin film bulk acoustic resonator (FBAR) to modify the interrogation signal thereby providing a unique RF response signal that may be used to identify the RF tag. In a first embodiment, shown in Figures 1-4, the RF tag 10 includes an antenna 12 for receiving the interrogation signal. The antenna 12 is connected to a tank circuit 14 which absorbs energy at a frequency F that is between I_L and I_H. As a result, the response signal (ranging from I_L to I_H in frequency), shown in Figure 3, is notch filtered, and *the interrogator identifies the RF tag by the position of the notch in the response signal.* In another embodiment, shown in Figures 5-7, the RF tag 30 uses a resonator 31 (in the form of a tank circuit as shown in Figure 1) and a frequency multiplier circuit 32. The frequency multiplier circuit 32 generates copies of the interrogation signal at integer multiples of the interrogation signal as shown in Figure 6. The resonance frequency F of the resonator 31 (i.e., the frequency that it absorbs) is chosen to lie in one of the higher frequency images. In the example shown in Figures 5-7, the resonance frequency F of the

resonator 31 is chosen to lie between $2I_L$ and $2I_H$. As a result, the response signal, shown in Figure 7, is a notch filtered signal having a frequency range between $2I_L$ and $2I_H$, and, like in the embodiment shown in Figure 1, *the interrogator identifies the RF tag by the position of the notch in the response signal.* In this second embodiment, the notch is moved to a higher frequency to avoid interference from noise that may be present at the lower frequencies.

Cook describes a central station 10 that transmits RF signals from an antenna 14, and a passive transponder unit 18 located remotely from the central station 10 that includes an antenna 16 for receiving the RF signals transmitted from the antenna 14. The transponder unit 18 is structured to reflect RF energy back to the central station 10 in response to receiving the RF signals transmitted from the antenna 14. In particular, the transponder unit 18 includes sensors 22 which respond to local conditions such as pressure or temperature, and the sensors 22 are coupled to the circuitry of the transponder 18 in such a fashion to *shift the phase of the received RF signals that were transmitted from the antenna 14.* This phase shifting allows information to be encoded into the RF energy that is transmitted back to the central station 10 (i.e., the extent of the phase shift conveys certain information about the local conditions). In other words, information relating to the local conditions is determined based on the phase shift of the response signal.

Thus, it is clear from the above descriptions that neither Ruby et al. nor Cook, alone or in combination, discloses a system wherein interrogating energy in converted into reflected energy having a different frequency than the interrogating energy, the reflected energy is sensed, a difference between the two frequencies is determined (by subtracting one from the other), and on the basis of the determined difference, a determination is made as to which specific antenna is present on an article, as required by claims 1 and 15. Accordingly, claim 15 is not anticipated by Ruby et al. as Ruby et al does not disclose all of the limitations of claim 15, and claim 1 would not have been obvious based on Ruby et al. in view of Cook, as Ruby et al. and Cook do not together disclose all of the limitations of claim 1. See MPEP §2142 ("To establish a *prima facie* case of obviousness ... the prior art reference (or references when combined) must teach or suggest all the claim limitations). Claims 1 and 15 are thus believed to be allowable.

Furthermore, it is clear from the above descriptions that neither Ruby et al. nor Cook, alone or in combination, discloses a system wherein (i) a non-linear element causes energy to be reflected in response to the receipt of interrogating energy wherein the frequency of the reflected energy is dependent on the value of the property being monitored and is different than the frequency of the interrogating energy, (ii) a difference between the two frequencies is determined (by subtracting one from the other), and (iii) on the basis of the

determined difference the state of a physical property being monitored is determined, as recited in claims 24 and 33. Accordingly, claims 24 and 33 would not have been obvious based on Ruby et al. in view of Cook, as Ruby et al. and Cook do not together disclose all of the limitations of claim 24 and 33. See MPEP §2142 ("To establish a *prima facie* case of obviousness ... the prior art reference (or references when combined) must teach or suggest all the claim limitations). Claims 24 and 33 are thus believed to be allowable.

In addition, because claims 2-14, 16-23, 25-32 and 34-41 depend, directly or indirectly, from one of claims 1, 15, 24 and 33, they are likewise believed to be allowable. Because these claims are believed to be clearly allowable based upon their dependence on one of claims 1, 15, 24 and 33, the Applicants have not specifically addressed the separate rejection of each of those claims, but hereby reserves the right to do so in the future should the need arise.

CONCLUSION

Based on the foregoing remarks, Applicant respectfully submits that claims 1-41 are in condition for allowance.

Please charge any additional fee or fees that may be due for this paper or credit any overpayment to Eckert Seamans Cherin & Mellott, LLC Deposit Account No. 02-2556. In addition, to the extent that an extension of time beyond that, if any, that has been requested is necessary to make this paper timely, the Applicants hereby petition for an extension of time that is sufficient to make this paper timely and authorize the Commissioner to charge the fee that is required for such an extension of time to Eckert Seamans Cherin & Mellott, LLC Deposit Account No. 02-2556.

If a telephone conference would facilitate prosecution of this application in any way, the Examiner is invited to contact the undersigned at the number provided.

Respectfully submitted,

By ______________________

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